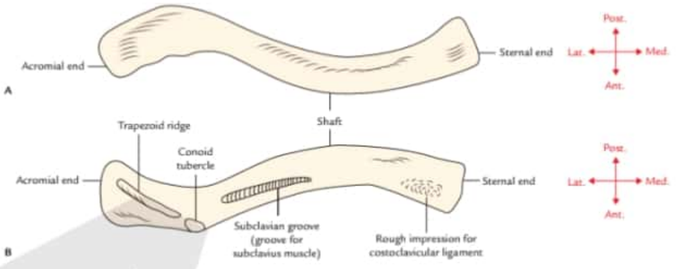
Integrated Orthopaedics

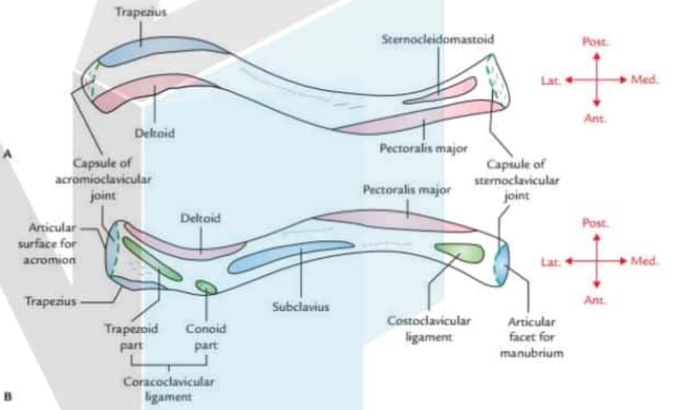
UPPER LIMB

1. CLAVICLE

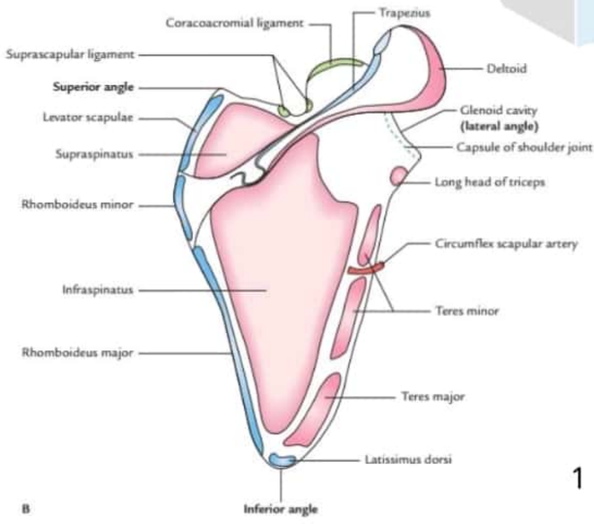
The peculiar features of the clavicle are as follows:

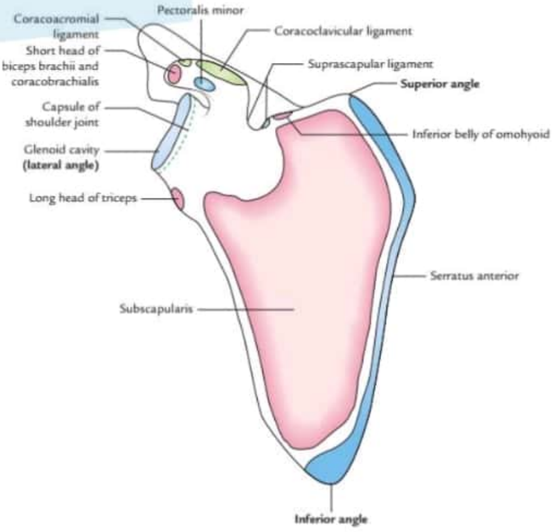
1. It is the only long bone which lies horizontally.
2. It has no medullary cavity.
3. It is subcutaneous throughout its extent.
4. It is the first bone to start ossifying (between the fifth and sixth week of intrauterine life) and last bone to complete its ossification (at 25 years).
5. It is the only long bone which ossifies by two primary centers.
6. It is the only long bone which ossifies in membrane except for its medial end (cf. long bones ossify in cartilage).
7. It may be pierced through and through by cutaneous nerve (intermediate supraclavicular nerve).



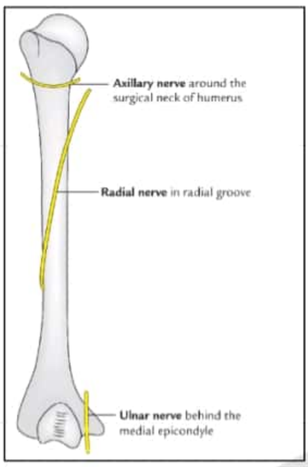


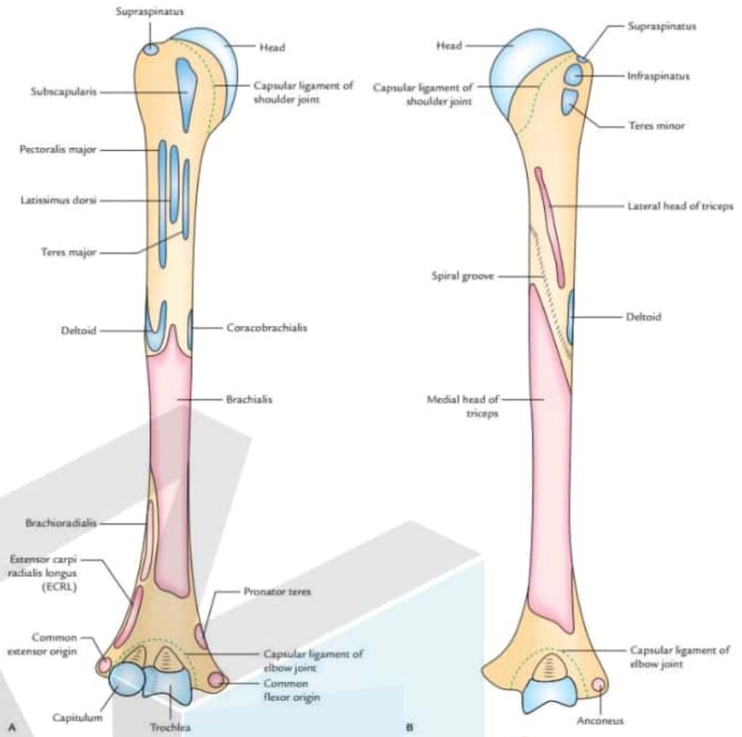
2. SCAPULA



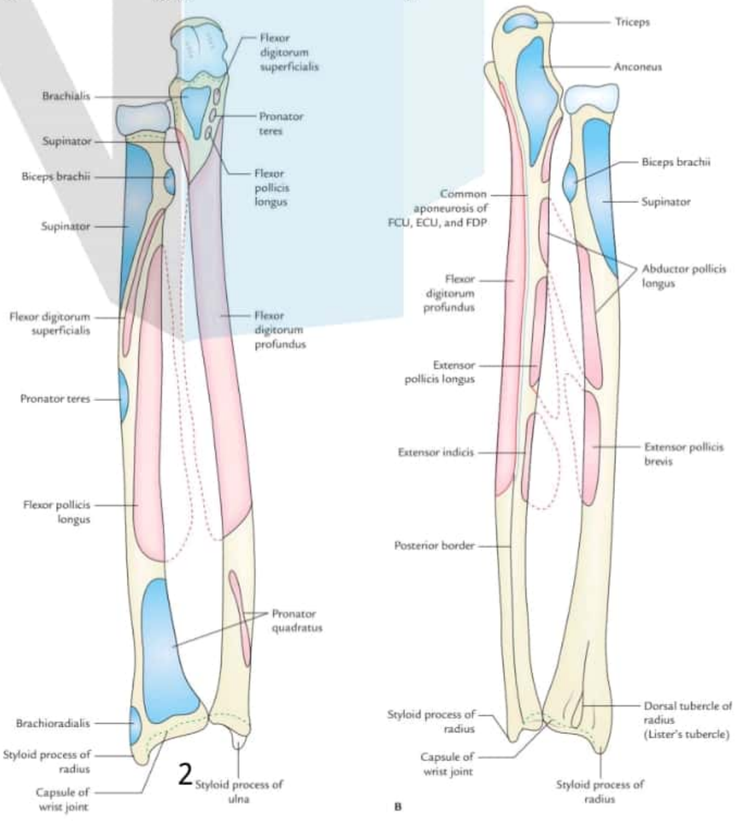


3. HUMERUS


Axillary nerve around the surgical neck of humerus
Radial nerve in radial groove
Ulnar nerve behind the medial epicondyle



4. Radius & Ulna



Fractures of Upper Limb

1. Bankart's fracture

A Bankart lesion is an injury of the **anterior (inferior) glenoid labrum of the shoulder** due to repeated anterior shoulder dislocation.

M/C Cause of recurrent anterior shoulder dislocation.

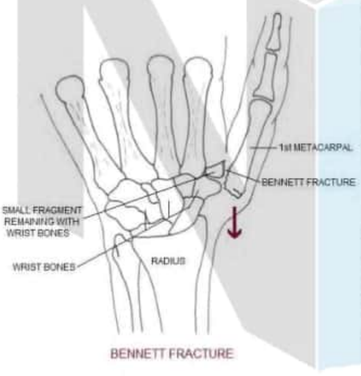
2. Hill- Sachs Fracture

2nd M/C Cause of anterior shoulder dislocation

Cortical depression in the **posterolateral head of humerus.**

3. Bennett's Fracture

Bennett fracture is an **intra articular** two-part fracture of the **base** of the **first metacarpal** extending into Trapezio-1st Metacarpal Joint



4. Rolando fracture

The Rolando fracture is a comminuted T / V/ Y shaped intra-articular fracture through the base of the first metacarpal bone extending into trapezio-1st Metacarpal Joint

5. Boxer's fracture

Usually a transverse fracture of the 5th metacarpal along the NECK with VOLAR ANGULATION
- The most common type of metacarpal fracture

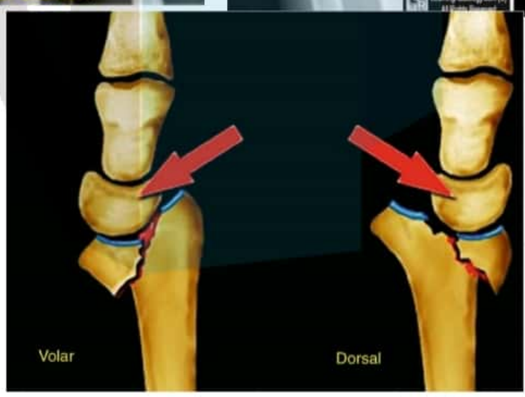
Boxer's Fracture
The end of the 5th metacarpal takes the force of the impact and breaks at its neck and angulates towards the palm creating a dorsal bump.

M/C : Metacarpal #

6. Barton's fracture

A Barton's fracture is an intra- articular fracture of the distal end of radius with dislocation of the radiocarpal joint.

Carpal bone involved is the Scaphoid bone



7. Chauffeur's fracture (Backfire fracture or Hutchinson fracture)

Intra articular fracture of the distal end of the radius with Avulsion of the **Radial Styloid Fragment**.

Radio- Scaphoid anatomy is NORMAL.

RadioCarpal Joint Subluxation + Intra articular fracture of distal end of radius + Intact Radial Styloid = Barton's Fracture

Intact RadioCarpal Joint + Intra articular Fracture of distal end of radius + Radial Styloid Fragment = Chaueffer's Fracture

8. Colles' fracture

Extra articular Fracture of the distal end of radius with dorsal / posterior displacement

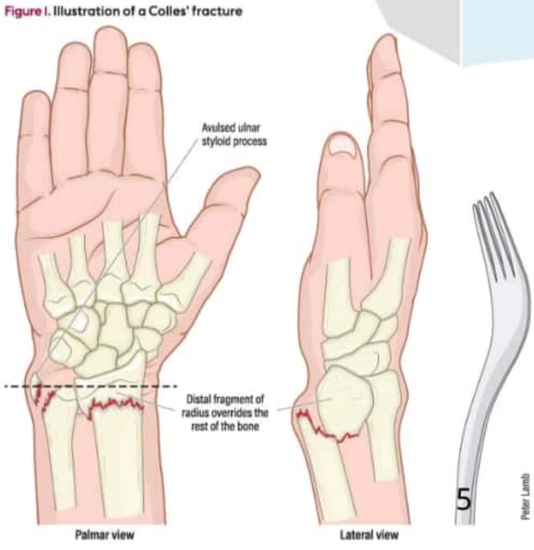


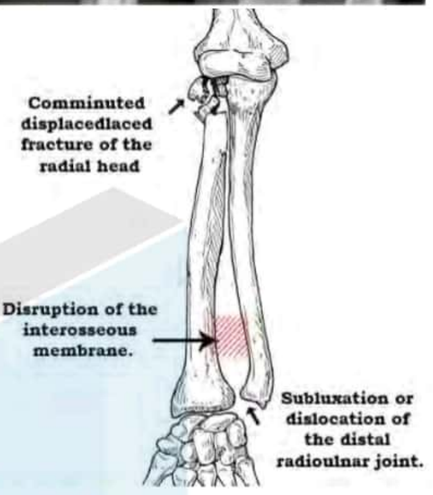
Figure I. Illustration of a Colles' fracture
Avulsed ulnar styloid process
Distal fragment of radius overrides the rest of the bone
Palmar view
Lateral view
5
Peter Lamb

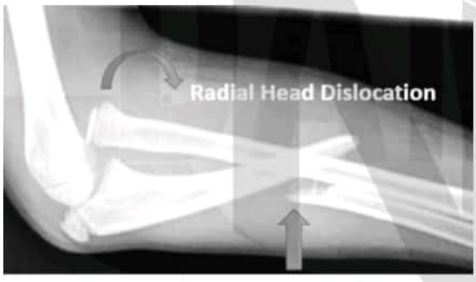
9. Smith's fracture / Reverse Colles' Fracture

Extra articular Fracture of the distal end of radius with volar / anterior displacement

10. Essex-Lopresti fracture

The Essex-Lopresti fracture is a fracture of the radial head with concomitant dislocation of the distal radioulnar joint with disruption of the interosseous membrane. (TRIAD)


Comminuted displacedlaced fracture of the radial head
Disruption of the interosseous membrane.
Subluxation or dislocation of the distal radioulnar joint.



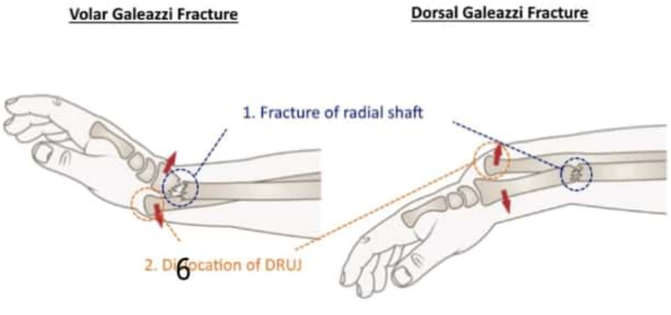
Fracture of Proximal one third of Ulnar Shaft

11. Monteggia fracture

The Monteggia fracture is a fracture of the proximal third of the ulna with dislocation of the head of the radius

12. Galeazzi fracture / Reverse Monteggia's / Piedmont's Fracture

Fracture of the radial shaft at the junction of Middle and Distal one third with Distal Radioulnar joint (DRUJ) Dislocation



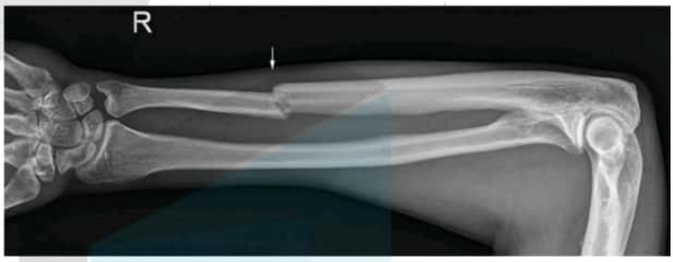
13. Greenstick #

- Most Common Fracture seen in childhood overall
- Unicortical Fractures / Incomplete Fractures of Forearm Bones (Radius > Ulna)
- Present in diaphysis
- Concavo Convex Deformity

a. b.

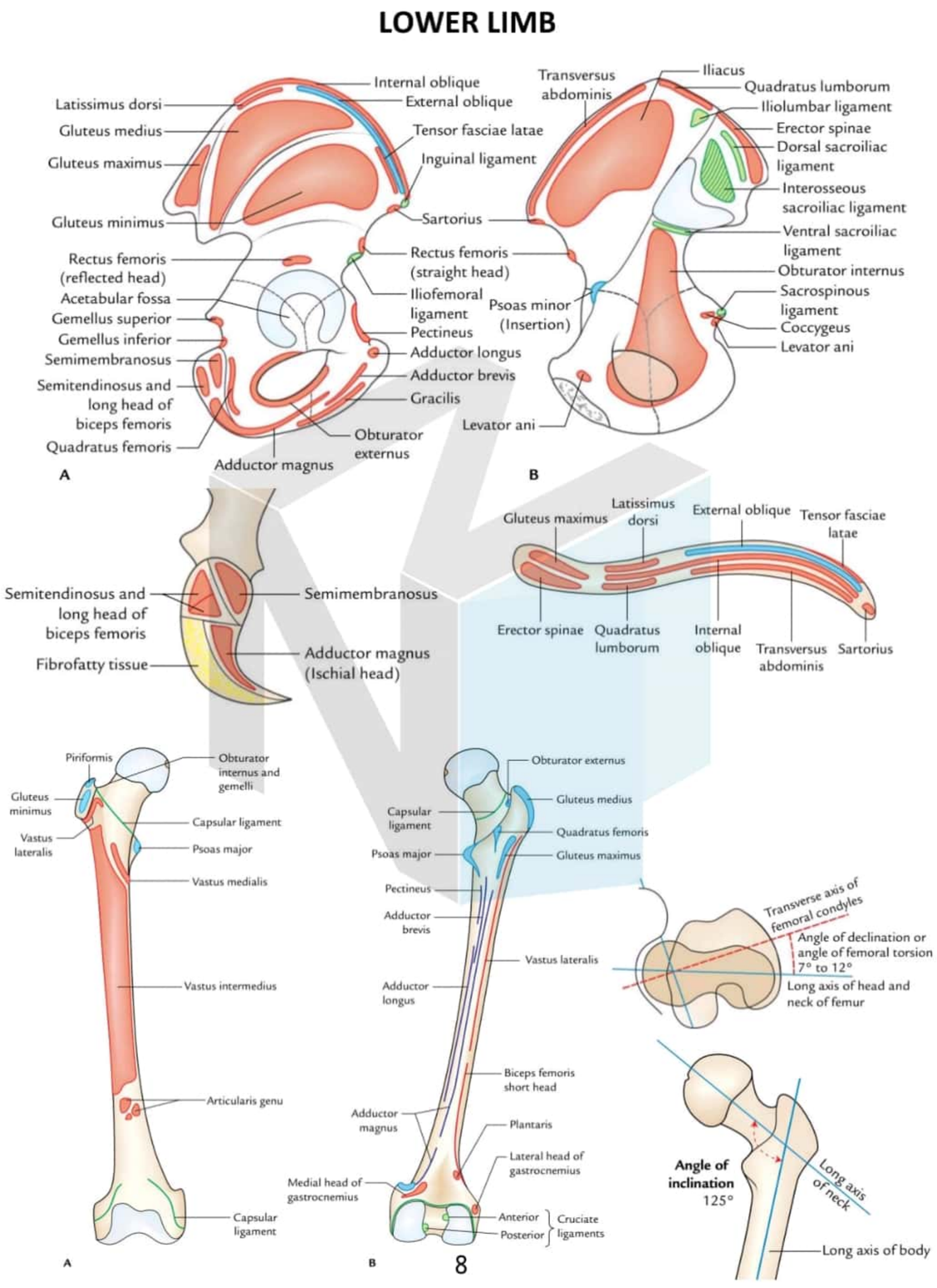
14. Nightstick #

ISOLATED FRACTURE OF SHAFT OF ULNA without associated fracture of the radius MOI - Direct Trauma to Forearm while in a defensive stance



15. Holstein–Lewis fracture

Oblique & Displaced Fracture of the distal third of the humerus resulting in entrapment of the radial nerve.


LOWER LIMB
Latissimus dorsi
Gluteus medius
Gluteus maximus
Gluteus minimus
Rectus femoris (reflected head)
Acetabular fossa
Gemellus superior
Gemellus inferior
Semimembranosus
Semitendinosus and long head of biceps femoris
Quadratus femoris
Internal oblique
External oblique
Tensor fasciae latae
Inguinal ligament
Sartorius
Rectus femoris (straight head)
Iliofemoral ligament
Pectineus
Adductor longus
Adductor brevis
Gracilis
Obturator externus
Adductor magnus
A
Transversus abdominis
Iliacus
Quadratus lumborum
Iliolumbar ligament
Erector spinae
Dorsal sacroiliac ligament
Interosseous sacroiliac ligament
Ventral sacroiliac ligament
Obturator internus
Sacrospinous ligament
Coccygeus
Levator ani
Psoas minor (Insertion)
Levator ani
B
Semitendinosus and long head of biceps femoris
Semimembranosus
Fibrofatty tissue
Adductor magnus (Ischial head)
Gluteus maximus
Latissimus dorsi
External oblique
Tensor fasciae latae
Erector spinae
Quadratus lumborum
Internal oblique
Transversus abdominis
Sartorius
Piriformis
Obturator internus and gemelli
Gluteus minimus
Capsular ligament
Vastus lateralis
Psoas major
Vastus medialis
Vastus intermedius
Articularis genu
Capsular ligament
A
Obturator externus
Gluteus medius
Capsular ligament
Quadratus femoris
Psoas major
Gluteus maximus
Pectineus
Adductor brevis
Vastus lateralis
Adductor longus
Biceps femoris short head
Adductor magnus
Plantaris
Lateral head of gastrocnemius
Medial head of gastrocnemius
Anterior
Posterior
Cruciate ligaments
B
Transverse axis of femoral condyles
Angle of declination or angle of femoral torsion 7° to 12°
Long axis of head and neck of femur
Angle of inclination 125°
Long axis of neck
Long axis of body
8

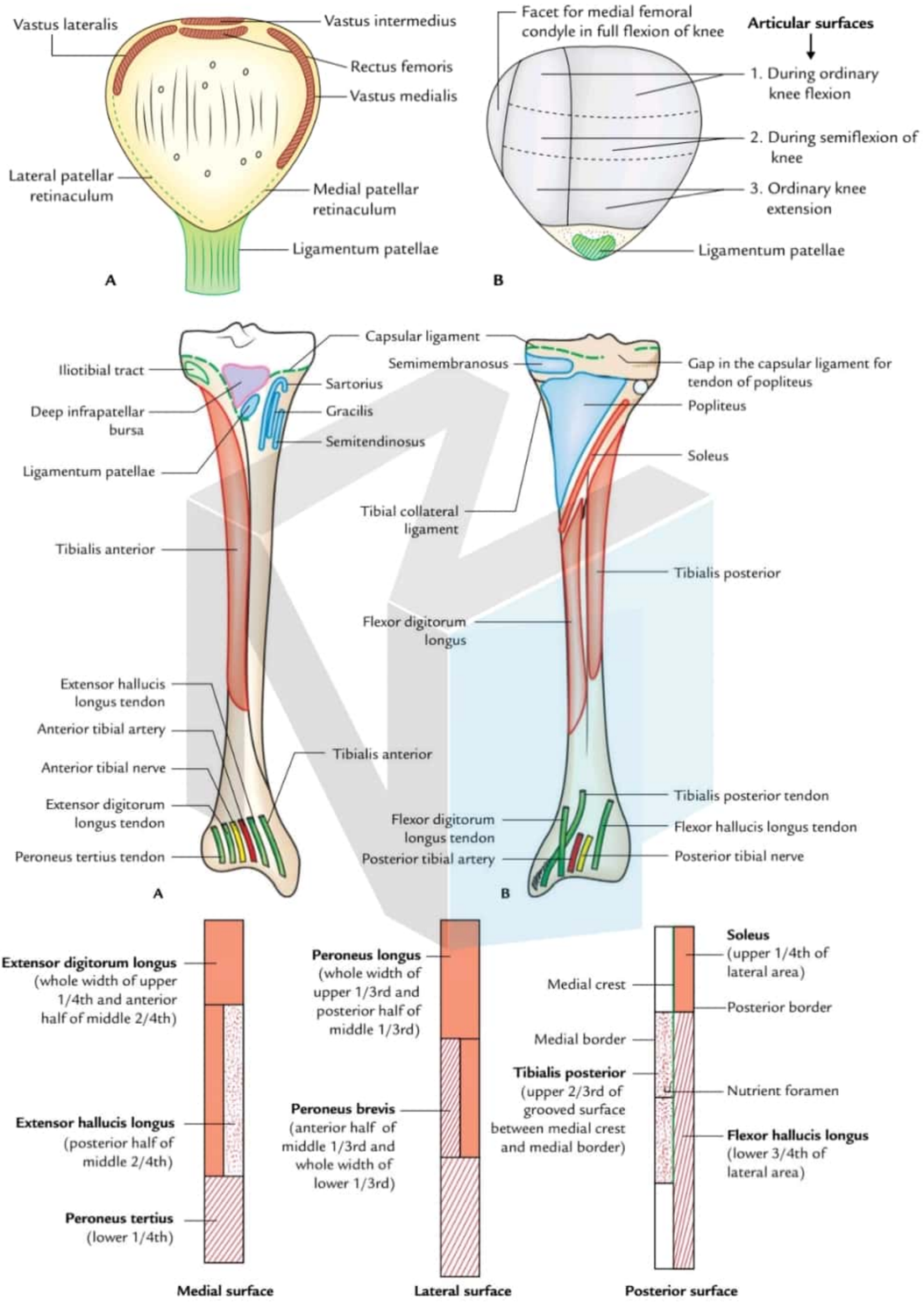


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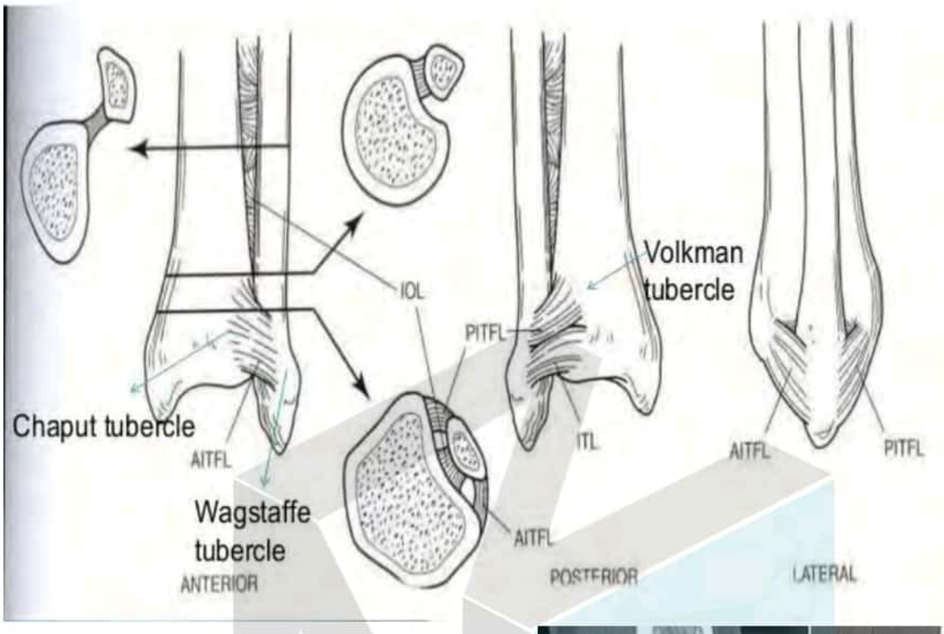
Fig. 21.18 Schematic diagram to show the attachments of muscles on the different surfaces of the fibula.

Anatomy: Syndesmosis



1. Tillaux-Chaput Fracture

Salter–Harris type III fracture through the anterolateral aspect of the distal tibial epiphysis.
It is the opposite end to a Wagstaffe-Le Fort avulsion fracture

2. Le Fort Wagstaffe's Fracture

Vertical fracture of the antero-medial part of the distal fibula with avulsion of the anterior tibiofibular ligament.

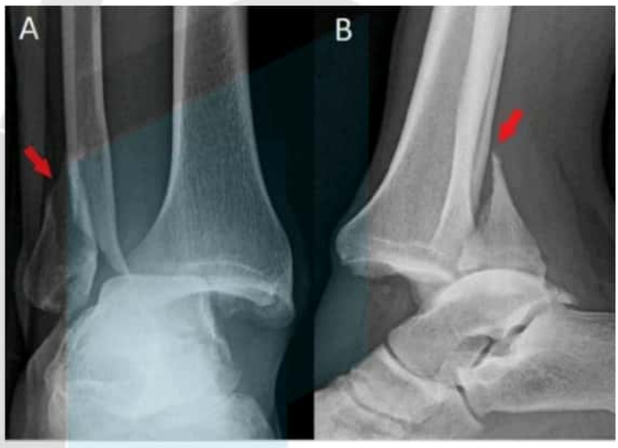
It is the opposite to a Tillaux-Chaput avulsion fracture

3. Maisonneuve fracture

Spiral fracture of the proximal third of the fibula + Tear of the distal tibiofibular syndesmosis and the interosseous membrane.

4. Bosworth Fracture

Fracture of the distal fibula with an associated fixed posterior dislocation of the proximal fibular fragment which becomes trapped behind the posterior tibial tubercle.



5. Gosselin Fracture

V- shaped fracture of the distal tibia which extends into the ankle joint and fractures the tibial plafond into anterior and posterior fragments.

Therefore intra-articular fracture.

6. Bumper #

Fracture of the lateral tibial plateau caused by a forced valgus applied to the knee.
MOI - forced valgus of knee when struck from side by car bumper

7. Segond's #

Avulsion fracture of the lateral tibial condyle of the knee (Capsular avulsion)
It is highly significant due to an associated **ACL Injury**

8. Stieda #

Avulsion fracture of the medial femoral condyle at the origin of the medial collateral ligament

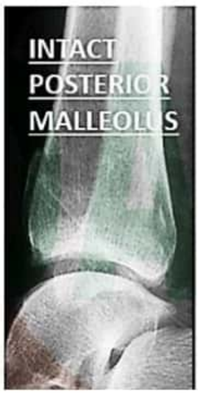
9. Lisfranc fracture

The Lisfranc injury is an injury of the foot in which one or more of the metatarsal bones are displaced from the tarsus / TARSOMETATARSAL JOINT FRACTURE DISLOCATION

10. Chopart's fracture-dislocation

It is a dislocation of the INTER TARSAL JOINTS (IT) / mid-tarsal (talonavicular and calcaneocuboid) joints of the foot, often with associated fractures of the calcaneus, cuboid and navicular.

LISFRANC's Fracture / Dislocation : Fracture dislocation of Tarso Metatarsal Joint (TMT)



11. Pott's fracture

Bimalleolar fracture of the ankle

12. Cotton's Fracture (Trimalleolar #)

A trimalleolar fracture is a fracture of the ankle that involves the lateral malleolus, the medial malleolus, and the distal posterior aspect of the tibia, which can be termed the posterior malleolus.

13. Jones #

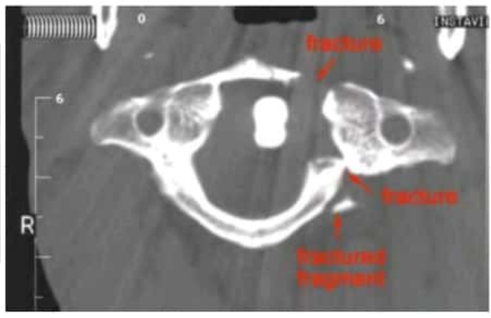
Fracture in the metadiaphyseal junction of the fifth metatarsal of the foot.

14. PseudoJones' Fracture / DANCER's FRACTURE / TENNIS FRACTURE

Avulsion Fracture of the tuberosity of base of 5th MT involving the articular margin

15. Jafferson's #

A Jefferson fracture is a fracture of the anterior and posterior arches of the C1 vertebra (ATLAS)

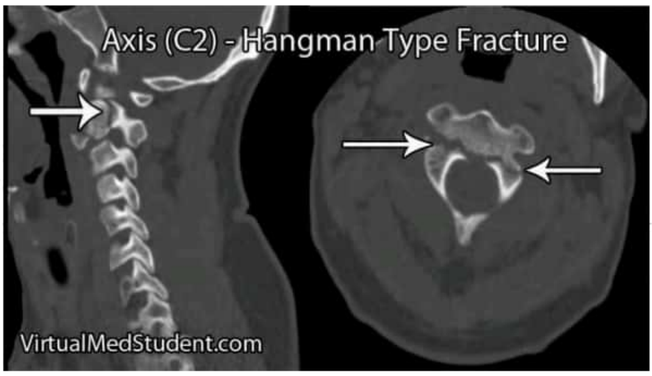


16. Chance fracture/ SEAT BELT INJURY / JACK KNIFE INJURY

Hyperflexion injury of the spine leading to transverse fracture through the posterior elements of the vertebra and the posterior portion of the vertebral body

17. Clay shoveller's fracture

It is a stable fracture through the spinous process of a vertebra occurring at any of the lower cervical or upper thoracic vertebrae C7 > T1



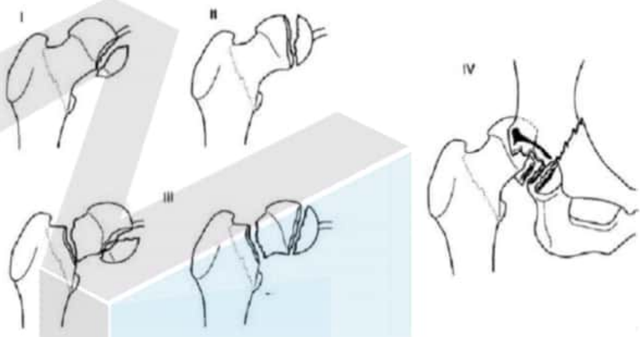
18. Hangman # Fracture of both pedicles or pars interarticularis of the axis vertebra (C2)

MOI - distraction and extension of neck

19. Pipkin fracture-dislocation

Posterior dislocation of hip with avulsion fracture of fragment of femoral head by the ligamentum teres

MOI - impact to the knee with the hip flexed (dashboard injury)



Pipkin's classification of femoral head fractures.
(Reproduced with permission from Pynsent, P. B., Fairbank, J. C. T. & Carr, A. J. *Classification of Musculoskeletal Trauma*. Butterworth-Heinemann (Hodder Arnold, 1999.)

20. Runner's fracture

Stress fracture of distal fibula 3–8 cm above the lateral malleolus
MOI – repeated axial stress on fibula

Calcaneal Fractures
"Lover's Fracture"

(Sustained after jumping from a window whilst fleeing a jealous lover's partner)

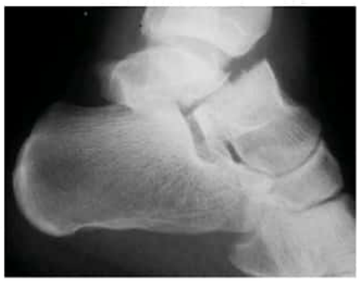
21. DON JUAN's FRACTURE / LOVER's FRACTURE

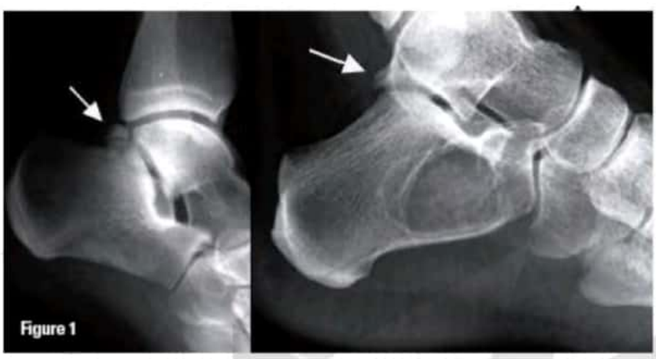
22. Aviator's Fracture :

Fracture of Neck of Talus

TALUS : Retrograde Blood Supply
MC Complication : SUB TALAR ARTHRITIS

(Landing on plantar-flexed toe while paragliding)





23. Shepherd's Fracture

Fracture of the lateral tubercle of the posterior process of the talus

24. Straddle fracture

Bilateral fractures of the superior and inferior pubic rami

25. Toddler's Fracture

Spiral Fracture of the Distal Tibia seen in children less than 8 years due to Accidental Fall
(CAST # : Childhood Accidental Spiral Tibial #)

Orthopedic Oncology

1. Osteochondroma

- AKA Exostosis
- Outpounching from metaphysis of te distal femur (M/C Site)
- Cap made up of cartilage; Stalk made up of bone
- M/C Benign Bone Tumor (but NOT a true Bone tumor since has a cartilage component)
- Seen in <18 years of age / M > F
- Pedunctulated > Sessile

2. Chondroblastoma

- < 18yrs of age, M > F
- M/C: Distal Femur Epiphysis
- Eccentric location
- Expansile lesion
- AKA Codman's Tumour
- Not invading the joint space
- HPE: Chicken Wire calcification
- (Caution- Not a Giant Cell tumour as GCT occurs in adults)

3. Osteoid Osteoma

- M/C True Benign Bone Tumour
- M/C Site: Femur (below neck) diaphysis
- Osteoid: Central Radiolucent lesion/Nidus (Excess Prostaglandins) with diamater < 2cm
- Osteoma: Peripheral reactive sclerotic rim
- C/F: Night pains (D/t PGs)
- Relived with Aspirin

4. Osteosarcoma

- Xray: Sunburst Appearance
- D/t periosteal reaction along the Sharpey's fibres
- Codman's Triangle (Nonspecific) – also seen in Ewing's Sarcoma

5. Giant Cell Tumour/Osteoclastoma

- Mature skeleton (20-40yr), F> M
- Epiphyseo-metaphyseal lesion usually extending upto articular margin
- Eccentric Expansile lesion
- Benign, locally aggressive, Soap bubble lesion
- Rx: Extended Currettage (2-5 cm of margin)
- No Single graft. Auto + Allograft Mix graft.

6. Aneurysmal Bone Cyst

- Expansile lesion
- IMMATURE skeleton, 10-16 yrs, F > M
- Metaphyseal leion
- Abuts the physis
- Rx: Extended Currettage (2-5 cm of margin)
- No Single graft. Auto + Allograft Mix graft.

7. Simple Bone Cyst

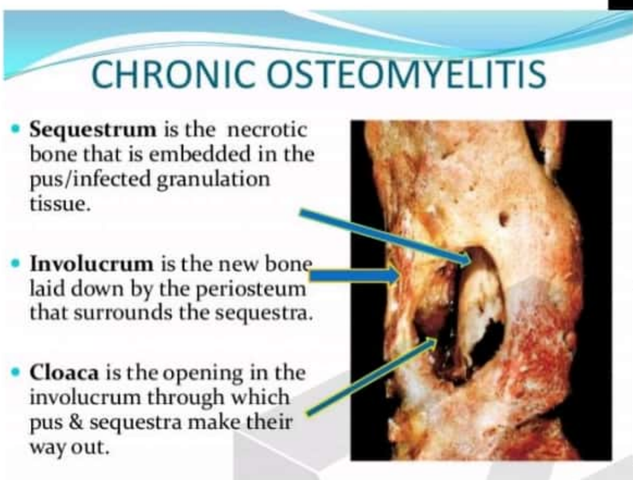
- Immature skeleton
- Centrally placed, unilocular lesion
- Not reaching the physis
- May lead to pathological # (Fallen Leaf sign)

8. Enchondroma

- Location: Small bones (Phalanges> metacarpals)
- M/C Bone tumor of Overall/benign tumour of hand bones
- Stippled calcification
- Chondroid Matrix filled lesion
- Benign lesion, M> F, 2nd to 5th decade, hand> Feet

Bone Infections

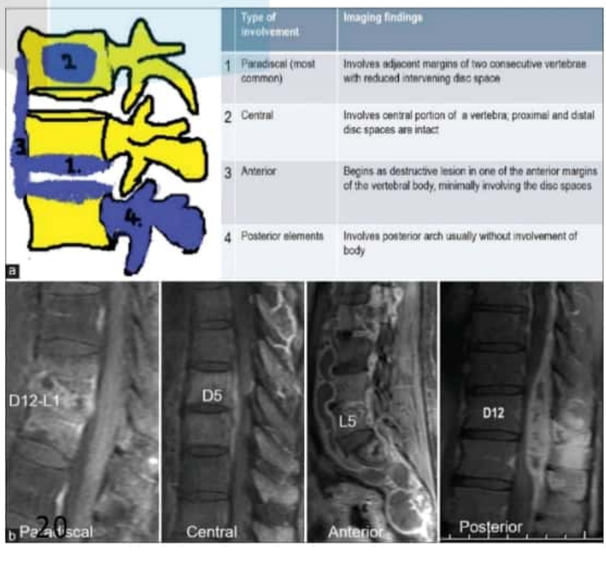
Chronic Osteomyelitis


CHRONIC OSTEOMYELITIS
• Sequestrum is the necrotic bone that is embedded in the pus/infected granulation tissue.
• Involucrum is the new bone laid down by the periosteum that surrounds the sequestra.
• Cloaca is the opening in the involucrum through which pus & sequestra make their way out.

SPINAL TUBERCULOSIS

- Sequence of organs commonly affected by TB: Lungs > LN> G.U. Tract > Skeleton
- Skeletal TB: Axial > Peripheral
- Axial Skeletal TB: Spine > Hips> Kneee
- Spinal TB: Lower Thoracic > Upper Lumbar> Thoraco-Lumabr Joint
- L/C Site for skeletal TB: Bursa
- M/C Bursa involved by TB: Trochanteric Bursa
- L/C Bone involved by TB: Mandible
- L/C Joint to be involved by TB: TMJ

- Paradiscal TB: Leads to Pott's paraplegia
- Central TB: Usually does not involve the intervertbral disc. Lead to Vertebral Plana
- Anterior TB: aka Wet TB/Edudative TB, seen in children
- Posterior: Least Common,
  L/C Structure to be involved- Facet Joint
  2nd L/C: Spinous process



Fish Mouth Spine

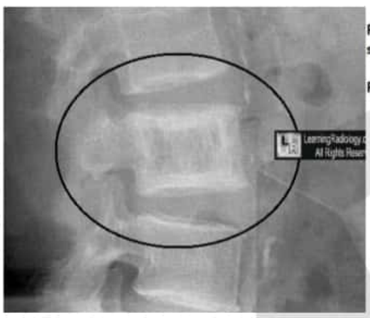
Seen in Osteomalacia

Also seen in Osteroporosis

Rugger Jersey seen in

1. Renal Dystrophy

2. Osteopetrosis



Picture Frame Vertebra seen in :

Paget's disease of bone

Bamboo Spine seen in:

Ankylosing spondylitis

a/w MARGINAL SYNDESMOPHYTES

Candle Wax Spine seen in:

Diffuse Idiopathic skeletal hyperostosis (DISH) Aka FORESTIER's Disease

a/w extra-marginal syndesmophytes

Ossification of Ant Longitudal Ligament

NEVER involves Sacro-Iliac Joint

	DISH	Ankylosing spondylitis
Syndesmophytes	Nonmarginal	Marginal
Radiographs	"Flowing candle wax"	"Bamboo spine", squaring of vertebral bodies, "shiny corners" at attachment of annulus fibrosus (Romanus lesions)
Disc space	Preservation of disc space	AS in cervical spine will show ossification of disc space
Osteopenia	No osteopenia (rather, there may be increased radiodensity)	Osteopenia present
HLA	No evidence of association with HLA-B27 Associated with HLA-B8 (common in patients with DISH and diabetes)	Strong association with HLA-B27
Age group	Older patients (middle aged)	Younger patients
SI joint involvement	No involvement (SI joint abnormality generally excludes diagnosis of DISH)	Bilateral sacroiliitis

Cock Up Splint

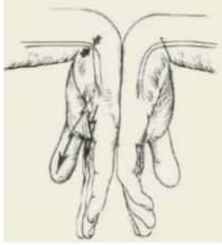
given in:
Radial Nerve Palsy

Knuckle Bender Splint

Seen in:
Ulnar Nerve Palsy

MCP joints are fixedhere. If free then cockup spint

Phalen's Test



- Therapist flexes client's wrists manually and holds together for one minute. Positive test elicits tingling in thumb, index finger, and middle and lateral half of the ring finger and is indicative of Carpal Tunnel Syndrome.

Carpal compression test

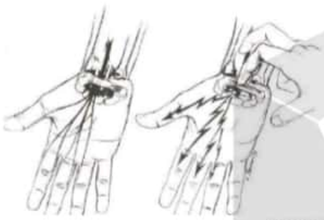
Durkan's test

Apply direct pressure with thumb on carpal tunnel for 1 min

Paresthesia in median nerve distribution is considered positive

Carpal Tunnel Syndrome – Tinel's Sign

Most sensitive and specific→ Durkan's test



- Tinel's Sign – When therapist taps over the carpal tunnel, the client will feel parasthesias or tingling distally

VASCULAR EVALUATION
ALLEN'S TEST

- Determines the patency of both the radial and the ulnar arteries.
- The hand exsanguinated by digital pressure of both arteries and the patient making strong fist.
- Pressure is released from the radial artery - patent return of color and capillary refil to the entire hand indicates patent radial artery and palmar arch.
- Repeat step A and release the ulnar artery.
- Normal filling time: <5 sec.
- Similar test with the digital arteries of the finger: The digital Allen's test.

- **Anterior/Posterior drawer**
- Athlete lying supine on table
- Bend knee to 90 degree angle
- Sit on athletes foot to provide stabilization
- Grasp posterior and anterior aspect of knee
- Apply anterior and posterior force while observing for laxity (ACL and PCL)

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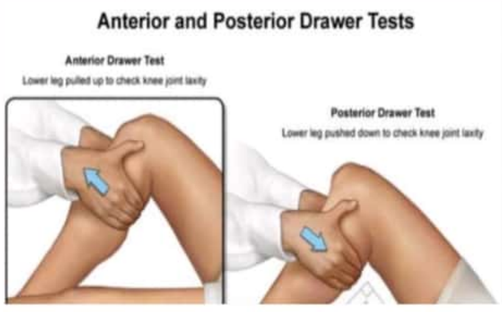
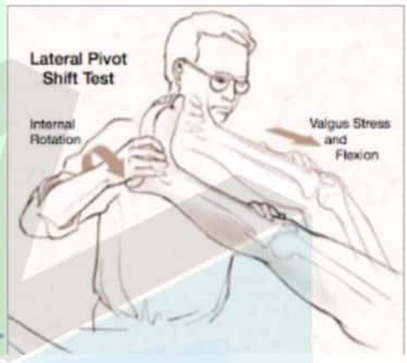

Anterior and Posterior Drawer Tests
Anterior Drawer Test
Lower leg pulled up to check knee joint laxity
Posterior Drawer Test
Lower leg pushed down to check knee joint laxity

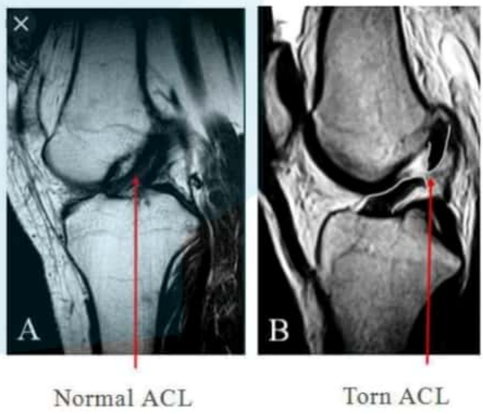
LACHMAN TEST

With the patient supine on the table and the injured knee flexed at 20 to 30 degrees, hold the patient's thigh with one hand and place your other hand beneath the tibia with the thumb of that hand on the tibial joint line. As you pull forward on the tibia, firm resistance suggests an unharmed anterior cruciate ligament (ACL). If, compared with the uninjured leg, the tibia moves freely without a hard endpoint, suspect ACL injury.

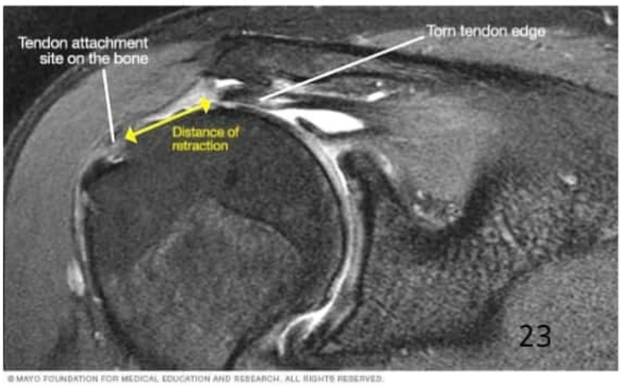
Pivot Shift Test

- Gold standard test for ACL
- Leg is externally rotated
- Valgus force is applied as leg is flexed
- Positive test indicated by clunk sensation





Rotator Cuff Injury



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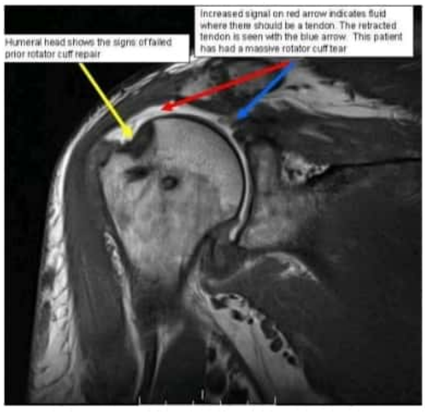
Humeral head shows the signs of failed prior rotator cuff repair
Increased signal on red arrow indicates fluid where there should be a tendon. The retracted tendon is seen with the blue arrow. This patient has had a massive rotator cuff tear